and third. One of them, which lasted ten seconds, was so powerful that not a single house remained uninjured. A general panic reigns in the town. Many of the inhabitants, including the Cardinal-Archbishop, have taken to flight. It is impossible to estimate the whole extent of the damage. The number of persons injured is at present estimated at thirty.

THE eruption of Vesuvius continues to increase in activity. Two large streams of lava are at present (November 8) flowing from the crater to the base of the cone.

IN Prof. Huxley's article on the *Challenger* Publications last week, line 11 from top of p. 2, col. 2, should read "*direct* and but little modified descendants," instead of "*dried*," &c.

OUR ASTRONOMICAL COLUMN

HARTWIG'S COMET (1880 *d*).—In a circular issued by Prof. Winnecke from the Observatory of Strasburg on the 1st inst., he gives reasons for assuming that the comet detected by Dr. Hartwig on September 29 may have a much shorter period than was conjectured in his first circular. On calculating parabolic elements from the Strasburg observations of September 29 and October 8, and one by Prof. Auwers at Berlin on October 17, MM. Ambronn and Wislicenus, students in the University of Strasburg, found the middle observation could not be more closely represented than with an error of something over two minutes of arc. Prof. Winnecke, as was stated in our previous notice, considered he had reason for suspecting the identity of Hartwig's comet with that of 1506, and a further examination of the historical descriptions has led him to direct attention to the comets of 1382, 1444, and 1569, and with the perihelion passage fixed to July 13, 1444, and October 15, 1569, he finds geocentric positions which he regards as in sufficient agreement with the records. A period of revolution of about 62⅓ years is therefore obtained, and an ellipse with this period has been adapted by Dr. Schur and Dr. Hartwig to the observations on September 29 and October 14 and 24. The resulting elements are as follow :—

Perihelion Passage, 1880, September 6·58949 M.T. at Berlin.

Longitude of perihelion	83 33 28	M. Eq. 1880·0.
,, ascending node ...	44 33 30	
Inclination	38 8 56	
Log. excentricity	9·990180	
Log. semi-axis major	1·196457	
Log. mean diurnal motion	1·755321	

The error of the place deduced from this ellipse on October 14 is + 28″ in longitude and the same in latitude, and it is remarked that the error in longitude does not admit of being destroyed without an increase of error in latitude. This, however, Prof. Winnecke suggests, may arise from the assumed period of 62⅓ years being really a multiple of the true one. The comet approaches near to the orbit of Mercury at the ascending node, though at the present time not sufficiently close to occasion any change in the character of the orbit. Still at some past epoch the effect of perturbation may have brought the orbits into coincidence or nearly so, and Prof. Winnecke hints that the planet Mercury might have been the means of impressing an elliptical form on the comet's orbit.

It is clearly a case in which those observers who are in the possession of very powerful instruments may render most material service towards deciding whether we have to do with a comet of comparatively short period. If it is practicable to secure good observations for position after the next period of moonlight, it may then be possible to obtain evidence *pro* or *con*, by direct computation of the orbit, though unfortunately observations did not commence until the comet had reached the extremity of the parameter, or in other words had attained an angular distance of 90° past the perihelion point.

DISCOVERY OF A COMET.—Lord Lindsay notifies the discovery of a comet at his observatory, Dunecht, during the night of the 7th inst., by Mr. Lohse in the constellation Lacerta ; the position at 15h. 30m. in R.A. 22h. 45m. 54s., Declination 42° 33′·7 ; daily motion in R.A. + 6m. 58s., in Decl. + 1° 8′. This is far from any position which the expected comet of 1812 could occupy on the above date.

CERASKI'S VARIABLE STAR.—Mr. Knott obtained a very complete observation of the descending and ascending light-curve of this newly-detected variable on November 2 ; the minimum appears to have occurred about 11h. G.M.T. The period will be somewhat less than 2½ days.

PHYSICAL NOTES

PROF. LORENZ has given in *Wied. Ann.*, No. 9, a development of his theory of "refraction-constants" (published before in Danish), and described experiments bearing on it. The problem contemplated was to find that function of the refractive index, freed from dispersion, and of the density of a body, which is constant with varying density of the body, supposing the molecules themselves unchanged. It is assumed that bodies consist of molecules in whose intervals light is propagated with the same velocity as in vacuous space ; further, that the bodies are isotropic, and their molecules of spherical form. Herr Lorenz arrives at a simple expression for the refraction-constant, the constancy of which, as also the correctness of the assumption as to light moving with the same velocity in the intervals of molecules as in vacuo, had to be proved. He determined the refraction constants of several bodies in the liquid and the vaporous states, viz., ethylic ether, ethylic alcohol, water, chloroform, ethylic iodide, ethylic acetate, and sulphide of carbon. The refraction was determined with sodium and lithium light, and at temperatures of 10°, 20°, and 100°. He found that in passage of the substances from the liquid to the vaporous state the refraction-constant varies very little (only about 5 per cent. at most). Dispersion also showed great constancy. Another Danish physicist, K. Prytz, has extended the inquiry to some ten other substances (*loc. cit.*), and confirmed the assumption of refraction constants.

WITH regard to electricity, Herr Hoorweg (*Wied. Ann.*, No. 9) divides all bodies into two groups, (*a*) those in which the conductivity rises with the temperature (dielectrics), and (*b*) those in which it decreases with rise of temperature (adielectrics). He endeavours to prove by experiment (1) that both dielectric bodies with adielectric, and adelectric with each other, yield contact electricity ; (2) that this electricity has always the same sign as that which arises with gentle friction or pressure. (The sometimes different action of strong friction is ascribed to the influence of the raising of temperature.) Not only does electricity arise through the different heat-motion at the places of contact of two heterogeneous substances, but this cause is fully sufficient to explain all development of electricity.

HERR NARR has lately obtained some interesting results in experimenting further on the behaviour of electricity in gases, and especially *in vacuo* (*Wied. Ann.*, No. 9). In the middle of a hollow brass sphere on a glass support was suspended a metallic ball by means of a platinum wire passing (insulated) through a metallic stopper to an electrometer. Vacua could be produced in the sphere. A charge of electricity imparted to the conducting system underwent the same process of dispersion *in vacuo* as where the space was full of gas. The outer surface of the hollow sphere, one minute and also one hour after the charging, had the same electricity as the conducting system. Herr Narr further finds that the process of dispersion in gas-filled space is not perceptibly influenced by the hollow sphere being insulated or being connected to earth, if the original charging be done while the sphere is connected to earth ; the dispersion constant diminishes in both cases, at least at the beginning. But if the conducting system be charged while the hollow sphere is insulated, the latter has in this state one minute, and likewise one hour to one hour and a half after, electricity of the same sign with the conducting system, and the first connection of the hollow sphere to earth occasions a temporary outflow. Herr Narr shows reasons for believing that the electricity on the hollow sphere finds its way through the gas-space.

A NEW series of experiments of extended range, by Herr Roth, on the compressibility of gases, is described in *Wied. Ann.*, No. 9. The relations between pressure, volume, and temperature, in the case of carbonic acid, sulphuric acid, ammonia, and ethylene, are studied. The results are mainly confirmatory of van der Waal's formulæ.

A NEW balance designed to be easily transportable, light, and yet stable, without fixing to the table, and to serve in inspection of widely various weights (by Government officials in Hungary), was lately brought before the Buda-Pesth Academy by Herr von Krasper (see *Wied. Beibl.* No. 9, p. 638). Among other features,

the prism-shaped steel bed, on which the middle knife-edge rests, is easily drawn out with the finger from the swallow-tail shaped rollers between which it is passed in the body of the balance. The beam can thus be easily removed and replaced. The balance rests on four feet. The stopping and raising arrangement is contained in a horizontal frame. Each weighing scale hangs on a conical point. Passing on to the reading, we find that the accuracy with which the balance works is, with 20 kg. weight, 2mg., with 500, 3½ mg.; and this is gained by substituting for the pointer an optical arrangement on the beam, consisting of two achromatic glass prisms, which render parallel the rays from opposite directions and send them to a telescope placed before the balance. At the two sides of the balance, about 2m. to 4m. from the middle knife-edge, two scales are set (best on the walls of the room); the images of these scales move in the field of the telescope beside each other in opposite directions, and so the corresponding divisions can be read off. These readings are independent of vibrations of the telescope, and are much more exact than those with telescope and cross threads, not to speak of the common pointer. The arrangement also permits of the centre of gravity of the balance being placed lower, the stability increased, &c. The weight of the balance is scarcely 20 kg., though both scales can carry 20 kg. weight.

EXPERIMENTS by Forbes in 1831 and by some others since seemed to warrant the view, now commonly held, that the metals fall into the same series as regards conduction of electricity and conduction of heat, that the quotient of the heat conductivity by electric conductivity is nearly constant. Herr H. F. Weber, inclined to doubt this as contradicting the view (proved for gases and liquids) that the amount of heat transferred within a substance from layer to layer is most intimately connected with the specific heat of unit volume, made new experiments in this relation (which he has described to the Berlin Academy). He measured the heat-conduction by observing the cooling of various metal rings in a space at constant temperature, and the electric conducting power of the same rings, by noting their deadening effect on the oscillations of a magnet. The result confirmed his anticipations, the quotient of heat-conduction by electric conduction being found in the closest connection with the specific heat of unit volume. Experiments by a different electrical method for metals conducting electricity badly (lead, bismuth, &c.) and for mercury gave the same result. (Ten metals in all were examined.) On the other hand, non-metallic conductors of electricity do not show the relation in question; *e.g.* the heat-conduction of carbon is at least twenty to thirty times greater than that calculated from the electric conductivity and the specific heat. Thus the relation seems to be connected with the metallic nature of the substance. Herr Weber found the heat-conducting power of all the solid metals examined to decrease with increasing temperature, but at a considerably less rate than the electric conductivity. He further offers explanations of the erroneous view adopted, noting, *inter alia*, that the experiments in one case, though exact, were on too few metals, and these had nearly the same specific heat.

PROF. R. B. WARDER of Haverford College (Pennsylvania) and Mr. W. P. Shipley have investigated the configurations assumed by floating magnets in a magnetic fluid. They have modified Prof. Mayer's original experiment by surrounding the vessel of water with a coil of wire traversed by a current, thus producing a field of force which, while still symmetrical about the centre, differs in several respects, the lines of force not being so greatly concentrated near the centre. Diagrams of various configurations are given by these experimenters in the *American Journal of Science* for October. As even a single one-fluid cell produces a current sufficient to show these results, they ought to be easy of repetition.

A COMPREHENSIVE memoir on the theory of the radiometer, by M. Mees, appears in the *Proceedings* of the Amsterdam Academy, and (in pretty full abstract) in *Wied. Beibl.*, No. 7. The author, after criticising the various theories that have been enumerated, which he arranges in three classes, offers his own explanation of the phenomena (which cannot be briefly stated here).

A FEW months ago we drew attention to certain results published by Herr Exner of Vienna, relative to thermoelectricity, and which were at variance with all the body of evidence existing in that branch of science. Herr Exner had in fact asserted that an antimony-bismuth couple possesses thermoelectric powers only so long as one of the two metals is in contact with oxygen or with a gas capable of acting on one of them. The wish we then expressed that some independent observations might be made by other physicists has met with a response across the Atlantic. Prof. C. A. Young of Princeton, N.J., communicated to the recent meeting of the American Association a paper on the thermoelectric power of a platinum-iron couple *in vacuo*. The crucial experiment was made with an exhausted glass tube containing an iron wire with platinum terminals, the terminals being again fastened to iron wires leading to a galvanometer. The tube was exhausted to one-millionth of an atmosphere. On laying the apparatus in the sunlight and alternately shading the internal or external junctions an electromotive force could be produced, which was found to be equal in every case. The conclusion Prof. Young draws from the experiment is that Exner is wrong in his statement that thermoelectric electromotive force is due to the action of the gaseous media in which the metals are plunged. The experiment was conducted in Mr. Edison's laboratory at Menlo Park.

GEOGRAPHICAL NOTES

THE glacier of the Zarafshan, one of the greatest in Central Asia, which has hitherto been very imperfectly known, was explored during this summer by MM. Mushketoff, geologist, and Ivanoff. The exploration was quite successful, and at the last meeting, October 26, of the Mineralogical Society at St. Petersburg, Prof. Mushketoff read a paper on his explorations. The lower extremity of the glacier is at the height of 9000 feet. The Galtcha people, who inhabit the upper valley of the Zarafshan, have never ascended the glacier; they say that on the summit of it there are two great pillars of stone, between which the traveller must go, and that the pillars would certainly crush together if any one ventured into the icy solitude. On August 25 the party began the ascent of the glacier on a very steep slope covered with blocks and moraines. A tunnel, no less than 3500 feet long, runs under the glacier, being the bed of the Macha River. After two days' travel the party had done seven miles on the glacier. The temperature during the day was as high as 40° Cels., and during the night as low as − 8°; some Galtchas who accompanied the party fell ill with fever. On the fourth day the party reached the first watershed, or rather the first iceshed; the whole length of the glacier to this point was sixteen miles, the width being one mile; six other glaciers, each of which is greater than the greatest Alpine glaciers, fed the principal one. At the head of it there is a wide *cirque* opening to the east; several peaks around it reach 20,000 feet. The descent on the other slope of the mountain ridge was far more steep and difficult than the ascent; the crevasses are very numerous and the glacier has several great "ice-falls," the inclination of which is no less than 50 degrees; the party was compelled to make use of small anchors and to cut steps in the ice. Two men were unwell and quite unable to go further when the party reached the foot of the eastern slope, after a very difficult journey.

THE last number of the *Izvestya* of the Russian Geographical Society contains a letter from Dr. Miklukho-Maclay. After having visited the islands of New Caledonia, Lifu, New Hebrides, Admiralty, Louisiade, &c., he reached, about the end of January, 1880, the south-eastern coast of New Guinea; here he explored several points of the coast, and thence went to the islands of the Torres Strait and to Somerset, to study the population of Northern Australia. On his voyage from Vaïhan Island to Sydney he stopped at several points of the eastern coast. From Sydney M. Maclay proposes to go to Japan, and thence to return to Russia. During his stay in Brisbane he was very kindly received by the local government and by private persons, who have much facilitated his anatomical studies by allowing him to work in the old museum and to make use of the photography of the topographical department. The journey in the interior of Queensland was very much facilitated by the cordial reception he received from the squatters, and by the kind permission to travel gratuitously along all the railways. M. Maclay expresses, in a letter addressed to the *Golos*, his thanks to the Australians for the reception he met from them, and wishes that all men of science were so kindly received in Russia. On August 12 he was in the house of J. B. Bell at Jimbor, near Dalby. The Russian public subscription has already reached 606*l.* which he received at Sydney.

A GOOD example is being set by the Tashkent College. During the summer fourteen pupils of the College, under the